

A REVERSIBLE FIBER OPTIC MODULE

Cross-Reference to Related Applications

This application claims the benefit of U.S. Provisional Application Number 60/428,175, filed 21 November 2002.

Field of the Invention

This invention relates to transceiver packages and, more particularly, to reversible fiber optic interconnections for transceiver packages.

Background of the Invention

At the present time, standard or common optoelectronic modules include optical-to-electrical and electrical-to-optical, hereinafter optoelectronic, packages. For example, the optoelectronic package can be a receiver, generally including some type of photodiode (e.g. a PIN diode, P/N diode, etc.) and/or the optoelectronic package can be a transmitter, generally including some type of laser, such as a vertical cavity surface emitting laser (VCSEL), an edge emitting laser,

1 cavity surface emitting laser (VCSEL), an edge emitting laser,
2 etc. These optoelectronic packages are generally used in pairs
3 for two-way communication by placing them side-by-side so they
4 can be inserted into the optoelectronic module. Throughout
5 this disclosure, the term "package" is used to denote a
6 complete optoelectronic transmitter, receiver, or some
7 combination of the two that is ready to have optical fibers
8 engaged therein. The term "module" is used to denote a
9 housing, case, or other holder constructed to receive an
10 optoelectronic package plugged or otherwise electrically
11 engaged therein.

12
13 One problem with this setup is that the optoelectronic
14 transmitter and receiver packages are not interchangeable
15 because of an asymmetry in their design. For example, in one
16 optoelectronic module, the transmitter would be on the left
17 side while the receiver would be on the right side. In this
18 configuration, it would not be possible to reverse this
19 orientation so that the receiver is positioned on the left side
20 and the transmitter is positioned on the right side. Hence, it
21 would be desirable to provide a common optoelectronic module
22 wherein the transmitter and receiver packages are
23 interchangeable.

24
25 It would be highly advantageous, therefore, to remedy the
26 foregoing and other deficiencies inherent in the prior art.

1 Accordingly, it is an object the present invention to
2 provide new and improved reversible optoelectronic modules,
3 i.e. any package or packages in the modules can be reversed,
4 and reversible fiber optic interconnections for the
5 optoelectronic modules.

6
7 Another object of the present invention is to provide new
8 and improved reversible optoelectronic modules with reduced
9 cost and complexity.

10
11 Another object of the present invention is to provide new
12 and improved reversible optoelectronic modules including
13 completely reversible optoelectronic transmitters and
14 optoelectronic receivers.

Summary of the Invention

Briefly, to achieve the desired objects of the instant invention in accordance with a preferred embodiment thereof, a new and novel optoelectronic module is disclosed. The module includes a housing defining first and second elongated, generally parallel, adjacent openings, each opening designed to receive in nesting engagement one of an optical transmitter package and an optical receiver package. Each of the first and second openings has optoelectronic circuitry therein for receiving mating optoelectronic circuitry mounted on received optoelectronic packages. Each of the first and second openings further defines a first and a second channel, the first and second channels each being constructed and positioned to slideably receive therein a ferrule formed on the received optoelectronic packages.

An optoelectronic transmitter package includes an elongated housing designed to be nestingly engaged in either of the first and second openings and has a ferrule formed along one of an upper and a lower side. Either of the upper and lower channels of the first and second openings is designed to slideably receive the ferrule of the transmitter package therein. An optoelectronic receiver package includes an elongated housing designed to be nestingly engaged in the other of the first and second openings and has a ferrule formed along

1 one of an upper and a lower side. Either of the upper and
2 lower channels of the first and second openings is designed to
3 slideably receive the ferrule of the receiver package therein.

1 Brief Description of the Drawings

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3 The foregoing and further and more specific objects and
4 advantages of the instant invention will become readily
5 apparent to those skilled in the art from the following
6 detailed description of a preferred embodiment thereof taken in
7 conjunction with the drawings, in which:

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9 FIG. 1 is a front view of an optoelectronic module;

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11 FIG. 2 is a front view of an optoelectronic package with
12 side-by-side transmitter and receiver packages;

13
14 FIG. 3 is an isometric view of the optoelectronic module
15 and the optoelectronic package in a pre-insertion position;

16
17 FIG. 4 is a front view of an optoelectronic module in
18 accordance with the present invention; and

19
20 FIG. 5 is an isometric view of the optoelectronic module
21 in accordance with the present invention.

1 DETAILED DESCRIPTION OF THE DRAWINGS

2

3 Turn now to FIG. 1 which illustrates an optoelectronic

4 module 5. Here it should be understood that FIGS. 1, 2, and 3

5 are provided for a basic understanding of the surrounding

6 structures and not as prior art. Optoelectronic module 5 is

7 constructed to define an opening 11 and an opening 13. Opening

8 11 is defined by a guide 10 with a trench 15 and opening 13 is

9 defined by a guide 12 with a trench 17. It will be understood

10 that guides 10 and 12 are typically formed of a molded plastic

11 fixedly attached to an elongated housing 8 (See FIG. 3).

12 Openings 11 and 13 are specifically designed to receive either

13 an optical-to-electrical or an electrical-to-optical package

14 but not both. In this example, opening 11 is constructed to

15 receive a transmitter package 24 (See FIG. 2) and opening 13 is

16 constructed to receive a receiver package 26 (See FIG. 2).

17

18 In module 5, it is desired to couple an optoelectronic

19 circuit 21 (See FIG. 2) within transmitter package 24 with an

20 optoelectronic circuit 14 positioned in opening 11 in module 5.

21 It is also desired to couple an optoelectronic circuit 23 (See

22 FIG. 2) within receiver package 26 with an optoelectronic

23 circuit 16 positioned in opening 13 in module 5. Here it will

24 be understood by those skilled in the art that optoelectronic

25 circuits 21 and 23 are generally optical fibers plugged into

26 transmitter package 24 and receiver package 26 and

1 optoelectronic circuits 14 and 16 are generally some form of
2 electrical circuit designed to convey electrical signals (i.e.
3 data or the like) to and from transmitter package 24 and
4 receiver package 26, respectively.

5

6 Turning now to FIG. 2, an optoelectronic package 7 is
7 illustrated. Package 7 includes transmitter package 24 and
8 receiver package 26. Transmitter and receiver packages 24 and
9 26 are typically physically coupled or joined with a connector
10 25 for ease of use. Further, transmitter package 24 includes a
11 ridge, rib, or guide, hereinafter ferrule 20, which is designed
12 to be slideably engaged in trench 15 (See FIG. 1), and receiver
13 package 26 includes a ridge, rib, or guide, hereinafter ferrule
14 22, which is designed to be slideably engaged in trench 17 (See
15 FIG. 2).

16

17 Turn now to FIG. 3, which illustrates an exploded view of
18 optoelectronic module 5 and optoelectronic package 7. As shown
19 in FIG. 3, optoelectronic package 7 is capable of nestingly
20 sliding into optoelectronic module 5. As can be seen,
21 transmitter package 24 slides into opening 11 with ferrule 20
22 fitting into trench 15 and, simultaneously, receiver package 26
23 slides into opening 13 with ferrule 22 fitting into trench 17.

24

25 However, the insertion of optoelectronic package 7 into
26 module 5 is not reversible under this configuration. For

1 example, connector 25 and the orientation of trenches 15 and 17
2 dictate the orientation of package 7 as described above.
3 However, as described in this disclosure, it is desirable to
4 provide for a reversible module (i.e. a reversible
5 orientation), wherein receiver package 26 can be engaged in
6 either opening 11 or opening 13 and transmitter package 24 can
7 be engaged in either opening 13 or opening 11.

8
9 Turn now to FIG. 4 which illustrates a reversible
10 optoelectronic module 9 in accordance with the present
11 invention. Reversible optoelectronic module 9 defines an
12 opening 31 and an adjacent opening 33. Openings 31 and 33 are
13 both specifically designed to receive either optical-to-
14 electrical or electrical-to-optical packages. For example,
15 opening 31 can receive transmitter package 24 (See FIG. 2) and
16 opening 33 can receive receiver package 26 (See FIG. 2) or vice
17 versa.

18
19 Opening 31 is further defined by an escutcheon or guide 30
20 designed to form an upper trench 35 and a lower trench 45.
21 Opening 33 is further defined by an escutcheon or guide 32
22 designed to form an upper trench 37 and a lower trench 47. It
23 will be understood that guides 30 and 32 are preferably formed
24 of a molded plastic fixedly attached to an elongated housing 40
25 (also see FIG. 5). It will also be understood by those skilled
26 in the art that the openings 31 and 33 in housing 40 can be

1 constructed to define the upper and lower trenches directly
2 without the use of guides 30 and 32, if desired. Further,
3 while the terms "upper" and "lower" are used herein in
4 conjunction with the figures, they are not intended to act as
5 any limitation on the position of the trenches and it will be
6 understood that the guides and/or trenches could be positioned
7 in a variety of different configurations.

8

9 In the preferred embodiment, module 9 includes light
10 indicators 38 and 39 associated with openings 31 and 33,
11 respectively. Indicators 38 and 39 are included to provide an
12 indication that an inserted or nested module, such as module 7,
13 is seated properly. Light indicators 38 and 39 can be, for
14 example, light emitting diodes or the like.

15

16 In this embodiment, module 9 is designed to have two modes
17 of operation. In one mode, optoelectronic circuit 21 within
18 transmitter package 24 (see FIG. 2) is coupled with an
19 optoelectronic circuit 34 in opening 31 of module 9. In this
20 same mode, optoelectronic circuit 23 within receiver package 26
21 (see FIG. 2) is also coupled with an optoelectronic circuit 36
22 in opening 33 of module 9. This mode is similar to that
23 described in FIGS. 1-3. In this example, transmitter package
24 24 slides into opening 31 with ferrule 20 being slideably
25 engaged in trench 35 and receiver package 26 slides into

1 opening 33 with ferrule 22 being slideably engaged in trench
2 37.

3

4 In another mode of operation, optoelectronic circuit 21
5 within transmitter package 24 (see FIG. 2) is coupled with
6 optoelectronic circuit 36. In this same mode, optoelectronic
7 circuit 23 within receiver package 26 (see FIG. 2) is also
8 coupled with optoelectronic circuit 34. In this example,
9 transmitter package 24 slides into opening 33 with ferrule 20
10 slideably engaged in trench 47 and receiver package 26 slides
11 into opening 31 with ferrule 22 slideably engaged in trench 45.

12

13 Thus, the insertion of optoelectronic package 7 into
14 module 9 is easily reversible under this configuration and
15 allows for a duplex form. Also, the optoelectronics associated
16 with each opening is designed to receive either of the
17 transmitter and/or receiver packages. This allows for the
18 installation of interchangeable fiber optic pairs.

19

20 Thus, new and improved reversible optoelectronic modules,
21 i.e. any package or packages in the modules can be reversed, is
22 disclosed and reversible fiber optic and electric
23 interconnections for the optoelectronic modules can be
24 provided. The new and improved reversible optoelectronic
25 modules substantially reduced cost and complexity in
26 manufacturing and use because optoelectronic packages, i.e.

1 optoelectronic transmitters and optoelectronic receivers, are
2 completely reversible within the optoelectronic modules.

3

4 Various changes and modifications to the embodiments
5 herein chosen for purposes of illustration will readily occur
6 to those skilled in the art. To the extent that such
7 modifications and variations do not depart from the spirit of
8 the invention, they are intended to be included within the
9 scope thereof which is assessed only by a fair interpretation
10 of the following claims.

11

12 Having fully described the invention in such clear and
13 concise terms as to enable those skilled in the art to
14 understand and practice the same, the invention claimed is: